



Career Cluster Resources for Architecture and Construction



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Introduction

The States' Career Cluster Initiative

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The U.S. Department of Education Office of Vocational and Adult Education (OVAE) has identified 16 career clusters representing career opportunities for the 21st century economy. These clusters will frame student opportunities as they pursue postsecondary education and a wide range of career opportunities from front-line to professional and managerial careers.

Helping students make their dreams become a reality was the driving force behind the nation's Career Clusters initiative launched June 1, 2001. Twelve lead states and the District of Columbia were partners in the development of the tools supporting eleven career clusters which, when combined with the five clusters that have already been developed, will represent all career possibilities.

The National Association of State Directors for Career and Technical Education Consortium (NASDCTEc) and their Board of Directors assumed leadership for coordinating the project. This in itself was unique for a project of this scope. The Board and the State Directors organization believed that this initiative was of such potential impact on the Career Technical delivery system in the country that they needed to play this leadership role in the project, assuring that the materials had utility in their states once completed. Therefore, the NASDCTEc in conjunction with the State of Oklahoma (the project fiscal agent) prepared and submitted a proposal to OVAE in January of 2001. This proposal was funded at a \$2.2 million dollar level, with expectations of a second year of funding of \$2.5 million. The plan to develop eleven curriculum frameworks was very aggressive, given that each of the prior projects, designed to develop and pilot test materials for a single cluster, had received in excess of \$1 million dollars for their multiyear development work.

The project was designed to establish curriculum frameworks and supportive materials for each cluster, with a broad-based advisory committee for each cluster, led by a state. There was also a National Advisory Committee consisting of members from each of the cluster committees, along with other stakeholders. The National and State Cluster advisory committees were responsible for identifying the frameworks, pathway and foundation knowledge and skills, and other supportive

materials. The committees included representatives from states, schools, education and training, business and industry, associations, and others directly impacted by the materials.

The development of materials for each of the eleven clusters was led by a different state, with business and industry at the helm. The lead states included: Idaho and Iowa (jointly leading the Agriculture, Food and Natural Resources cluster), Pennsylvania (Architecture and Construction), Ohio (Marketing, Sales and Service), North Dakota (Finance), West Virginia (Hospitality and Tourism), South Carolina (Business, Management and Administration), Kentucky (Human Services), Arkansas (Law, Public Safety and Security), North Carolina (Science, Technology, Engineering and Mathematics), Michigan (Education and Training), and Oklahoma and the District of Columbia/Washington D.C. (jointly leading the Government and Public Administration cluster).

The five additional career clusters included Health Science led by the State of Utah, Manufacturing led by the State of Indiana, Arts, Audio Video Technology and Communications led by the V-TECS Consortium, Information Technology led by the Educational Development Center, Inc., and Transportation, Distribution and Logistics Cluster led by the State of Illinois. These clusters plan to complete their work by June 30 of 2003.

To facilitate and coordinate the developmental work of the Cluster Initiative, staff was identified and housed at the Oklahoma Department of Career and Technical Education. The staff consisted of four Cluster Coordinators: Marsha Daves, Greg Dewald, Curtis Shumaker, and Pam Stacey. Additionally, Denise Christy provided research and web development support, Lisa Batchelder provided financial support, and Karan Smith provided administrative support.

Development work for the States' Career Clusters Initiative began June 1, 2001, and the first meeting of lead states, OVAE staff, and cluster staff was held in Oklahoma City in mid-June. At this meeting, project objectives, general direction, timelines, and the initial research goals were identified. This work continued through the fall and winter of 2001 and included the identification of cluster advisory committee members, the development of cluster frameworks based on the prototype cluster models provided by V-TECS, and the identification of occupations and draft pathways along with degrees and certificates associated with the career specialties/occupations in each of the clusters.

In January of 2002, the lead state teams were brought together in Phoenix to begin the process of developing knowledge and skill statements for each of the cluster pathways and foundations. Contracted writers and lead state cluster advisory committee members, depending upon

the decisions of cluster leadership, carried out this work. A part-time editor in Oklahoma provided consistency across the cluster knowledge and skill statements. One concern that was addressed early in the process was the need for a “common look and feel” across the clusters. Ultimately, this was accomplished not only for the eleven clusters in the States’ Career Clusters Initiative, but also through close cooperative relationships between the projects, all the cluster knowledge and skill statements were developed (or retro-fitted) using the same format. This format includes a knowledge/skill statement with associated performance elements and measurement criteria. This format provides the tools needed for curriculum and assessment developers as they take the materials to the classroom.

The National Advisory Committee met in March of 2002, and reviewed the curriculum frameworks, credentials list, and lead state advisory committee memberships and structures, and forwarded those materials to the Executive Committee for the Project. The Executive Committee, made up of the Board of the NASDCTEc, also met in March, approved the materials and discussed the future actions needed to assure implementation of the cluster materials.

Originally, the project was designed for a minimum of two years and was to include the identification of 110 pilot test sites across the country, along with the development of assessments and certifications for the clusters. The Office of Vocational and Adult Education, however, determined in November of 2001 that the goals of the project were “too broad”, and terminated the project as of September 30, 2002.

Development of the products needed for curriculum and assessment was fast-tracked, with the knowledge and skill statements, performance elements and measurement criteria ready for validation by July 15, 2002. This was the result of a major effort of lead state advisory committees and staff responding to the shortened timeline and the need for quality product.

Given the efforts of the developmental teams, cluster advisory committee members were able to review and validate the knowledge and skills and supporting elements. Additionally, a national web-based validation was conducted from July 15 to August 15, 2002. All 50 states were invited to a dissemination meeting held in Charleston, South Carolina Sept 13, 2002, where the materials were distributed to participants for their use in updating their curriculum.

For further information on the status of the materials, go to the web-site, <http://www.careerclusters.org/>.

Section I – Pathway Model



Careers in designing, planning, managing, building and maintaining the built environment.

Sample Career Specialties / Occupations	<p>Architect • Architectural and Civil Drafter • Drafter • Regional and Urban Planner/Designer • Industrial Engineer • Materials Engineer • Mechanical Drafter • Environmental Designer • Civil Engineer (structural, geotechnical, transportation, etc.) • Programmer • Mechanical Engineer (HVAC, plumbing, fire protection, etc.) • Electrical Engineer (electronics, security, telecommunications) • Preservationist • Environmental Engineer (hydro engineering, acoustical, etc.) • Landscape Architect • Surveyor • Fire Prevention and Protection Engineer • Cost Estimator • Electrical and Electronic Engineering Technician • Civil Engineering Technician • Environmental Engineering Technician • Surveying and Mapping Technician • Interior Designer • Landscape Designer • Specifications Writer • Building Code Official • Computer Aided Drafter (CAD) • Renderer (traditional and computer) • Modeler (traditional and computer)</p>		
	<p>General Contractor/Builder • Specialty Contractor • Construction Engineer • Construction Manager • Superintendent • Project Manager • Construction Foreman • Estimator • Project Inspector • Manufacturer's Representative • Sales and Marketing Manager • Equipment and Material Manager • Scheduler • Education and Training Director/Coordinator • Safety Director • Construction Inspector • Subcontractor • Preservationist • Service Contractor • Field Supervisor • Specialty Trades Subcontractor • Mason • Construction Craft Laborer • Iron/Metalworker (structural and reinforcing) • Carpenter • System Installer • Electrician • Boilermaker • Electronic Systems Technician • Sheetmetal Worker • Security and Fire Alarm Systems Installer • Concrete Finisher • Glazier • Tile and Marble Setter • Landscaper/Groundskeeper • Elevator Installer • Roofer • Painter • Explosives Worker • Plasterer/Drywall • Paperhanger • Insulation Worker • Drywall Installer • Plumber • Pipe Fitter • Millwright • Heating, Ventilation, Air Conditioning and Refrigeration Mechanic • Carpet Installer • Electrician • Steamfitter • Terrazo Worker and Finisher</p>		<p>General Maintenance Contractor • Specialty Contractor • Construction Engineer • Construction Manager • Superintendent • Project Manager • Construction Foreman • Estimator • Facilities Engineer • Reliability Engineer • Environmental Engineer • Demolition Engineer • Project Inspector • Operating Engineer • Manufacturer's Representative • Sales and Marketing Manager • Equipment and Material Manager • Scheduler • Maintenance Planner/Scheduler • Maintenance Estimator • Security Controls Manager • Preservationist • Remodeler • Safety Director • Construction Inspector • Subcontractor • Service Contractor • Field Supervisor • Specialty Trades Subcontractor • Mason • Iron/Metalworker (structural and reinforcing) • Carpenter • System Installer • Electrician • Boilermaker • Cost Estimator • Sheetmetal Worker • Security and Fire Alarm System Installer • Concrete Finisher • Glazier • Tile and Marble Setter • Hazardous Materials Remover • Landscaper/Groundskeeper • Elevator Installer • Paperhanger • Insulation Worker • Drywall Installer • Insulation Worker • Plumber • Pipe Fitter • Millwright • Heating, Ventilation, Air Conditioning and Refrigeration Mechanic • Carpet Installer • Electrician • Steamfitter • Terrazo Worker and Finisher • Refractory Technician • Hydro Testing Technician • Thermal Control Technician • Restoration Technician • Wastewater Maintenance Technician • Highway Maintenance Worker</p>
Pathways	Design/Pre-Construction	Construction	Maintenance/Operations
Cluster K&S	<p>Cluster Knowledge and Skills</p> <p>♦ Academics ♦ Communications ♦ Problem Solving and Critical Thinking ♦ Information Technology Applications ♦ Systems ♦ Safety, Health and Environmental ♦ Leadership and Teamwork ♦ Ethics and Legal Responsibilities ♦ Employability and Career Development ♦ Technical Skills</p>		



Section II – Cluster Knowledge and Skills

Architecture and Construction

Cluster Knowledge and Skill Statement

Academic Foundations

Statement: *Perform math operations to complete jobsite/workplace tasks such as estimating and distributing materials and supplies.*

Performance Element: Use geometric formulas to determine areas and volumes of various structures.

Measurement Criteria: *Calculate areas and volumes of structures.*

Measurement Criteria: *Estimate materials and supplies needed.*

Performance Element: Use appropriate formulas to determine percentages /decimals.

Measurement Criteria: *Calculate percentages/decimals.*

Measurement Criteria: *Use percentages/decimals to perform measurement tasks.*

Performance Element: Use appropriate formulas to determine ratios, fractions, and proportion measures.

Measurement Criteria: *Calculate ratios, fractions and proportion measures.*

Measurement Criteria: *Use ratios, fractions and proportion measures to perform measurement tasks.*

Performance Element: Use appropriate formulas to determine measurements of dimensions, spaces and structures.

Measurement Criteria: *Measure dimensions, spaces and structures using U.S. Standard unit.*

Measurement Criteria: *Measure dimensions, spaces and structures using Metric units.*

Measurement Criteria: *Use dimensions, spaces and structures calculations to estimate materials and supplies needed.*

Statement: *Perform physics skills to work with materials and load applications.*

Performance Element: Apply basic concepts of static and loads to planning.

Measurement Criteria: *Use the basic concepts of static and load calculations for rigging and moving loads.*

Performance Element: Identify the physical properties present when using common construction materials in order to use the materials safely, effectively and efficiently.

Measurement Criteria: *Use the basic concepts of physics when working with common construction materials.*

Statement: *Manage workplace and jobsite chemical materials safely.*

Performance Element: Recognize the issues present when mixing compatible and incompatible substances to maintain workplace/jobsite safety.

Measurement Criteria: *Differentiate between incompatible and compatible substances.*

Measurement Criteria: *Prevent the mixing of incompatible substances.*

Performance Element: Describe the chemical process that occurs when using common construction materials to maintain workplace/jobsite safety.

Measurement Criteria: *Apply chemical processes in relation to environmental conditions.*

Measurement Criteria: *Apply chemical processes in relation to construction building materials.*

Statement: *Read, understand and respond to English language technical and workplace documents to effectively function in the workplace/jobsite.*

Performance Element: Read, interpret and use technical and workplace documents to

Architecture and Construction

Cluster Knowledge and Skill Statement

accomplish workplace/jobsite assignments.

Measurement Criteria: *Read and understand industry-specific terminology.*

Measurement Criteria: *Interpret workplace documents.*

Measurement Criteria: *Use verbal or written processes to report key information.*

Measurement Criteria: *Use technology to transmit reports.*

Measurement Criteria: *Read, understand and interpret blueprints, drawings and specifications.*

Measurement Criteria: *Use written communications such as written estimates, work orders and memos.*

Measurement Criteria: *Read and follow manufacturer's instructions and manuals.*

Statement: *Write clear and effective English to prepare workplace/jobsite information.*

Performance Element: **Complete reports and documents to comply with project requirements.**

Measurement Criteria: *Compose an accurate and organized diary/log of work.*

Measurement Criteria: *Write reports and documents such as estimates, permits, memos, technical reports and work orders that meet industry standards.*

Architecture and Construction

Cluster Knowledge and Skill Statement

Communications

Statement: *Use and follow industry specific verbal and visual skills to accomplish workplace/jobsite communications.*

Performance Element: Match verbal and visual communications to industry specific situations.

Measurement Criteria: *Use correct terminology to convey verbal and visual communications.*

Performance Element: Listen attentively and speak clearly to convey information correctly.

Measurement Criteria: *Confirm understanding of verbal and visual instructions.*

Measurement Criteria: *Ask questions concerning details of instructions.*

Measurement Criteria: *Perform assignments as requested.*

Statement: *Listen to and speak with a variety of individuals to enhance communication skills.*

Performance Element: Speak succinctly and clearly to convey information.

Measurement Criteria: *Speak so that others can understand and carry out information presented.*

Performance Element: Listen attentively to spoken messages to respond to information.

Measurement Criteria: *Perform oral instructions.*

Statement: *Exhibit public relation skills to address a variety of situations such as increasing internal and external customer/client satisfaction.*

Performance Element: Communicate effectively to develop positive customer/client relationships.

Measurement Criteria: *Develop and maintain customer relations.*

Measurement Criteria: *Apply relationship skills in a variety of situations.*

Measurement Criteria: *Define customer/client satisfaction.*

Measurement Criteria: *Evaluate customer/client satisfaction.*

Architecture and Construction

Cluster Knowledge and Skill Statement

Problem Solving and Critical Thinking

Statement: *Identify the relationship between available resources and requirements of a project/problem to accomplish realistic planning.*

Performance Element: Estimate resources/materials required for a specific project/problem including time management, labor management, job management and job site obligations in order to effectively plan.

Measurement Criteria: *Estimate correct amount of required resources/materials.*

Performance Element: Use available resources/materials effectively to complete project or resolve a problem.

Measurement Criteria: *Evaluate waste of resources/materials.*

Measurement Criteria: *Evaluate necessity for additional resources/materials.*

Performance Element: Determine alternative solutions for a specific project/problem in order to effectively plan.

Measurement Criteria: *Evaluate feasibility of alternative suggestions.*

Measurement Criteria: *Implement appropriate alternatives.*

Statement: *Evaluate and adjust plans/schedules to respond to unexpected events and conditions.*

Performance Element: Incorporate potential job disruptions into planning time lines.

Measurement Criteria: *Identify potential events and conditions that disrupt the completion of a job.*

Measurement Criteria: *Solve situational problems involved with unexpected events and conditions.*

Performance Element: Adjust plans and schedules to meet project needs.

Measurement Criteria: *Modify existing plans to reflect an unexpected change.*

Measurement Criteria: *Modify existing schedules to reflect an unexpected change*

Performance Element: Identify and assess critical situations as they arise to resolve issues.

Measurement Criteria: *Evaluate potential solutions and determine best solution.*

Measurement Criteria: *Appraise critical situations and implement appropriate response.*

Performance Element: Provide a project update to track changes necessitated by unexpected events and conditions.

Measurement Criteria: *Present an oral and/or written status report on the project.*

Statement: *Synthesize and report conditions to keep the organization appraised of progress and problems.*

Performance Element: Provide a project update to keep stakeholders up to date.

Measurement Criteria: *Present an oral and written status report on the project.*

Architecture and Construction

Cluster Knowledge and Skill Statement

Information Technology Applications

Statement: *Use information technology tools specific to Architecture and Construction to access, manage, integrate and create information.*

Performance Element: Manage personal schedule and contact information.

Measurement Criteria: *Create tasks (to-do) list.*

Measurement Criteria: *Manage daily/weekly/monthly schedule using applications.*

Measurement Criteria: *Manage personal and professional contact information.*

Performance Element: Create memos and notes.

Measurement Criteria: *Create personal reminders.*

Measurement Criteria: *Create and send notes, informal memos, and reminders using applications.*

Performance Element: Use a CAD System to perform drafting duties.

Measurement Criteria: *Interpret CAD drawings.*

Measurement Criteria: *Retrieve and modify drawings using a CAD System.*

Measurement Criteria: *Create drawings using a CAD System.*

Statement: *Use Electronic Mail applications.*

Performance Element: Use email to communicate within and across organizations.

Measurement Criteria: *Access email system using login and password functions.*

Measurement Criteria: *Access email messages received.*

Measurement Criteria: *Create email messages in accordance with established business standards (e.g., grammar, word usage, spelling, sentence structure, clarity, e-mail etiquette).*

Measurement Criteria: *Practice email etiquette.*

Measurement Criteria: *Send email messages.*

Performance Element: Use email to share files and documents.

Measurement Criteria: *Access email attachments.*

Measurement Criteria: *Attach documents to messages.*

Measurement Criteria: *Save email messages/attachments.*

Measurement Criteria: *Practice contamination protection strategies for email.*

Statement: *Use Internet applications.*

Performance Element: Search for information and resources.

Measurement Criteria: *Select search engine(s) to use.*

Measurement Criteria: *Select appropriate search procedures and approaches.*

Measurement Criteria: *Locate information using search engine(s) and Boolean logic.*

Measurement Criteria: *Navigate web sites using software functions.*

Performance Element: Access and evaluate Internet resources.

Measurement Criteria: *Access business and technical information using the Internet.*

Measurement Criteria: *Access commercial, government, and education resources.*

Measurement Criteria: *Evaluate Internet resources (e.g., accuracy of information).*

Statement: *Use Writing/Publishing applications.*

Performance Element: Prepare simple documents and other business communications.

Measurement Criteria: *Retrieve existing documents.*

Architecture and Construction

Cluster Knowledge and Skill Statement

Measurement Criteria: *Create documents (e.g., letters, memos, reports) using existing forms and templates.*

Measurement Criteria: *Safeguard documents using name and save functions.*

Measurement Criteria: *Format text using basic formatting functions.*

Measurement Criteria: *Employ word processing utility tools (e.g., spell checker, grammar checker, thesaurus).*

Statement: *Use Spreadsheet applications.*

Performance Element: **Create a spreadsheet.**

Measurement Criteria: *Create spreadsheets.*

Measurement Criteria: *Retrieve existing spreadsheets.*

Measurement Criteria: *Edit spreadsheets.*

Measurement Criteria: *Save spreadsheets.*

Measurement Criteria: *Print spreadsheets.*

Performance Element: **Perform calculations and analysis on data.**

Measurement Criteria: *Group worksheets.*

Measurement Criteria: *Create charts and graphs from spreadsheets.*

Measurement Criteria: *Perform calculations using simple formulas.*

Measurement Criteria: *Input/process data using spreadsheet functions.*

Statement: *Use Database applications.*

Performance Element: **Manipulate data elements.**

Measurement Criteria: *Enter data using a form.*

Measurement Criteria: *Locate/replace data using search and replace functions.*

Measurement Criteria: *Process data using database functions (e.g., structure, format, attributes, relationships, keys).*

Statement: *Use Collaborative/Groupware applications.*

Performance Element: **Facilitate group work through management of shared schedule and contact information.**

Measurement Criteria: *Manage daily/weekly/monthly schedule using applications.*

Measurement Criteria: *Maintain shared database of contact information.*

Statement: *Use Computer Operations applications.*

Performance Element: **Manage computer operations.**

Measurement Criteria: *Apply basic commands of operating system software.*

Measurement Criteria: *Employ desktop operating skills.*

Performance Element: **Manage file storage.**

Measurement Criteria: *Apply appropriate file and disk management techniques.*

Measurement Criteria: *Differentiate between files and directories.*

Measurement Criteria: *Determine file organization.*

Measurement Criteria: *Use system utilities for file management.*

Statement: *Use computer-based equipment (containing embedded computers (or processors) used to control electromechanical devices).*

Performance Element: **Operate computer-driven equipment and machines.**

Measurement Criteria: *Secure needed supplies and resources.*

Measurement Criteria: *Follow power-up and log-on procedures.*

Architecture and Construction

Cluster Knowledge and Skill Statement

Measurement Criteria: *Interact with/respond to system messages using console device.*

Measurement Criteria: *Run applications/jobs in accordance with processing procedures.*

Measurement Criteria: *Follow log-off and power-down procedure(s).*

Performance Element: Use installation and operation manuals.

Measurement Criteria: *Access needed information using appropriate reference materials.*

Performance Element: Troubleshoot computer-driven equipment and machines and access support as needed.

Measurement Criteria: *Test system using diagnostic tools/software.*

Measurement Criteria: *Repair/replace malfunctioning hardware.*

Measurement Criteria: *Reinstall software as needed.*

Measurement Criteria: *Recover data and/or files.*

Measurement Criteria: *Restore system to normal operating standards.*

Architecture and Construction

Cluster Knowledge and Skill Statement

Systems

Statement: *Comply with governmental regulations and applicable codes to establish a legal and safe workplace/jobsite.*

Performance Element: Identify occupation-specific governmental regulations and national, state and/or local building codes to establish workplace/jobsite regulations and codes.

Measurement Criteria: *Follow governmental regulations and building codes.*

Measurement Criteria: *Use information given in regulations and codes correctly.*

Measurement Criteria: *Pass job inspections and comply with regulations at all times.*

Performance Element: Monitor workplace/jobsite activities to comply with governmental and other applicable safety regulations such as EPA and OSHA.

Measurement Criteria: *Read and discuss information on OSHA, EPA and other safety regulations.*

Measurement Criteria: *Pass safety inspections and comply with regulations at all times.*

Performance Element: Use MSDS information to manage, use and dispose of hazardous materials.

Measurement Criteria: *Obtain, understand and follow MSDS information.*

Measurement Criteria: *Use hazardous materials safely.*

Performance Element: Identify workplace/jobsite environmental hazards to promote workplace/jobsite safety.

Measurement Criteria: *Follow safe practices relating to environmental hazards.*

Statement: *Examine relationship of roles and responsibilities between trades/professions to complete a project/job.*

Performance Element: Plan, organize, schedule and manage a project/job to optimize workflow sequence.

Measurement Criteria: *Report results of the project/job.*

Performance Element: Use time management skills to schedule a project/job.

Measurement Criteria: *Identify timeline required to complete a project/job.*

Measurement Criteria: *Evaluate efficiency and effectiveness of a project/job.*

Performance Element: Recognize relationships between trades/professions to facilitate smooth workflow.

Measurement Criteria: *Coordinate work between trades.*

Performance Element: Recognize the hierarchy of the jobsite to facilitate smooth workflow.

Measurement Criteria: *Incorporate job functions in the reporting chain of supervision.*

Measurement Criteria: *Evaluate the safety issues and responsibilities managed by each level of supervision.*

Statement: *Examine all aspects of the built environment and its' systems to complete project planning.*

Performance Element: Align and incorporate the built environment and its systems to the project to complete project.

Measurement Criteria: *Label all systems on a set of construction documents.*

Measurement Criteria: *Discuss the interrelationship of the systems in the built environment.*

Architecture and Construction

Cluster Knowledge and Skill Statement

Measurement Criteria: *Use the concept of "Critical Path Method (CPM)" and/or similar sequential methods so that work progresses efficiently.*

Statement: *Apply industry standards and practices for quality to ensure quality work.*

Performance Element: Identify industry standards and practices in order to incorporate quality into projects.

Measurement Criteria: *Document how quality improves profitability.*

Measurement Criteria: *Report on issues that affect quality.*

Performance Element: Use industry standards and practices to appreciation for quality workmanship.

Measurement Criteria: *Perform work meeting or exceeding the quality standards of the industry.*

Measurement Criteria: *Exhibit pride in personal work.*

Cluster Knowledge and Skill Statement

Safety, Health, and Environmental

Statement: *Observe rules and regulations to comply with personal and jobsite safety standards.*

Performance Element: Align safety issues with appropriate safety standards to ensure a safe workplace/jobsite.

Measurement Criteria: *Practice safety rules and regulations.*

Performance Element: Identify safety precautions and hazards to ensure a safe workplace/jobsite.

Measurement Criteria: *Use appropriate safety practices and equipment.*

Performance Element: Select, inspect and use personal protective equipment (PPE) such as respiratory protection and fall protection equipment to ensure a safe workplace/jobsite.

Measurement Criteria: *Inspect personal protective equipment to ensure safety.*

Measurement Criteria: *Report defects found in personal protective equipment.*

Measurement Criteria: *Use appropriate personal protective equipment.*

Measurement Criteria: *Wear appropriate personal protective equipment to protect yourself and set an example for co-workers.*

Performance Element: Employ hierarchy and workflow of the workplace/jobsite to ensure safety.

Measurement Criteria: *Perform job site safety procedures at all times.*

Measurement Criteria: *Use, interpret and respond to barricades, barriers, and other visual warnings.*

Architecture and Construction

Cluster Knowledge and Skill Statement

Leadership and Teamwork

Statement: *Establish specific goals to manage project assignments in a timely manner.*

Performance Element: Establish project goals in order to met project specifications and deadlines.

Measurement Criteria: *Define and describe project goals.*

Measurement Criteria: *Identify and list key project activities.*

Measurement Criteria: *Identify and report activity deadlines.*

Performance Element: Organize work teams to effectively manage assignments.

Measurement Criteria: *Determine and list assignments by activity and personnel.*

Measurement Criteria: *Complete assignments.*

Measurement Criteria: *Monitor and write a report on progress of the project.*

Measurement Criteria: *Evaluate completed project according to customer requirements.*

Statement: *Effectively resolve conflicts with co-workers to maintain a smooth workflow.*

Performance Element: Use conflict resolution skills to maintain a smooth workflow.

Measurement Criteria: *Work collaboratively and cooperatively.*

Measurement Criteria: *Give and receive criticism in a diplomatic and constructive manner.*

Measurement Criteria: *Use diplomatic and constructive statements and responses.*

Statement: *Work as an individual and as a team member to accomplish assignments.*

Performance Element: Use human relations skills to work cooperatively with co-workers representing different cultures, genders and backgrounds.

Measurement Criteria: *Work effectively with a variety of co-workers.*

Performance Element: Track team goals to contribute constructively and positively to the team.

Measurement Criteria: *Work effectively within the organization of a team.*

Measurement Criteria: *Perform work as a team member on a project.*

Performance Element: Match team members to appropriate activities.

Measurement Criteria: *Identify team goals.*

Measurement Criteria: *Identify team member strengths and weaknesses.*

Performance Element: Manage personal skills to accomplish assignments.

Measurement Criteria: *Plan, organize, and manage individual work.*

Statement: *Use mentoring skills to inspire others to achieve.*

Performance Element: Use motivational techniques to enhance performance in others.

Measurement Criteria: *Practice motivational techniques.*

Measurement Criteria: *Develop and use reward and incentive systems.*

Architecture and Construction

Cluster Knowledge and Skill Statement

Ethics and Legal Responsibilities

Statement: *Exhibit personal accountability, integrity and responsibility to enhance confidence among co-workers.*

Performance Element: Apply the professional and ethical standards of the industry to workplace/jobsite conduct.

Measurement Criteria: *Practice professional and ethical standards.*

Measurement Criteria: *Maintain personal integrity.*

Measurement Criteria: *Promote personal and professional integrity in coworkers.*

Measurement Criteria: *Recognize integrity in others.*

Statement: *Read regulations and contracts to ensure ethical and safety elements are observed.*

Performance Element: Study regulations and codes to identify those applicable to the local area.

Measurement Criteria: *Locate and implement regulations and codes applicable to tasks and projects.*

Measurement Criteria: *Comply with local, state and Federal agencies and model code setting organizations.*

Performance Element: Read and explain the various aspects of service contracts to ensure compliance.

Measurement Criteria: *Evaluate and follow service contracts.*

Performance Element: Recognize the relationship between the various parties to a contract in order to interpret responsibilities.

Measurement Criteria: *Fulfill your contractual role and responsibilities.*

Performance Element: Recognize the definition of specialized words or phrases to fully understand documents and contracts.

Measurement Criteria: *Use industry jargon or terminology appropriately.*

Measurement Criteria: *Use industry acronyms correctly.*

Measurement Criteria: *Use words with multiple meanings correctly in context.*

Statement: *Use ethical and legal standards to avoid conflicts of interest.*

Performance Element: Identify conflicts of interest relating to a job or project to prevent ethical or legal problems.

Measurement Criteria: *Resolve issues relating to any potential conflicts of interest.*

Statement: *Recognize legal and ethical relationships between employees and employers to establish workplace/jobsite rules, regulations and guidelines.*

Performance Element: Access appropriate resources to identify the roles, rights and responsibilities of an employee and an employer.

Measurement Criteria: *Practice workplace/jobsite conduct incorporating employee and employer roles, rights and responsibilities.*

Performance Element: Examine insurance documentation to determine liability issues associated with a job.

Measurement Criteria: *Describe liability issues as needed.*

Performance Element: Comply with employer policies and procedures such as sexual harassment avoidance and substance abuse control to prevent ethical and legal problems.

Measurement Criteria: *Practice policies and protocol.*

Architecture and Construction

Cluster Knowledge and Skill Statement

Employability and Career Development

Statement: *Exhibit a positive work ethic to comply with employment requirements.*

Performance Element: Exhibit behaviors showing you are reliable and dependable.

Measurement Criteria: *Arrive at work fit and on time each day.*

Measurement Criteria: *Behave dependably.*

Measurement Criteria: *Behave honestly and fairly.*

Performance Element: Maintain appropriate dress and behavior for the job to contribute to a safe and effective workplace/jobsite.

Measurement Criteria: *Observe company and workplace/jobsite rules.*

Performance Element: Complete required employment forms and documentation such as I-9 form, work visa, W-4 and licensures to meet employment requirements.

Measurement Criteria: *Provide verification that requirements have been met.*

Statement: *Recognize requirements for career advancement to plan for continuing education and training.*

Performance Element: Identify opportunities for career advancement to formulate career goals.

Measurement Criteria: *Identify career ladder.*

Measurement Criteria: *Develop career advancement plan.*

Measurement Criteria: *Implement career advancement plan.*

Measurement Criteria: *Review progress of career advancement plan.*

Performance Element: Maintain positive interpersonal skills to enhance advancement potential.

Measurement Criteria: *Perform quality work as measured by a performance evaluation.*

Performance Element: Pursue education and training opportunities to acquire skills necessary for career advancement.

Measurement Criteria: *Document successful completion of education and training opportunities.*

Measurement Criteria: *Participate in professional development opportunities such as professional organizations and associations, trade shows and seminars.*

Performance Element: Read trade magazines and journals, manufacturers' catalogues, industry publications and internet sites to keep current on industry trends.

Measurement Criteria: *Identify and prepare for new and emerging occupations, practices and procedures as well as declining occupations and practices.*

Performance Element: Examine the organization and structure of various segments of the industry to prepare for career advancement.

Measurement Criteria: *Recognize segments of the construction industry and show the relationships to specialty areas.*

Measurement Criteria: *Obtain necessary knowledge and skills to enhance employability.*

Architecture and Construction

Cluster Knowledge and Skill Statement

Performance Element: Research local and regional labor (workforce) market and job growth information to project potential for advancement.

Measurement Criteria: *Identify sources of career information.*

Measurement Criteria: *Identify job opportunities for the trade.*

Measurement Criteria: *Identify organizations that offer career and job placement.*

Measurement Criteria: *Analyze potential growth of identified careers.*

Measurement Criteria: *Apply labor market and job growth information to career goals.*

Statement: *Examine licensing, certification and credentialing requirements at the national, state and local levels to achieve compliance.*

Performance Element: Align licensing, certification and credentialing requirements to career goals in order to plan for career advancement.

Measurement Criteria: *Use technologies and resources to research licensing certification and credentialing.*

Measurement Criteria: *Evaluate and select suitable sources of licensing, certification and credentialing.*

Measurement Criteria: *Identify licenses, certifications and credentials applicable to career goals.*

Measurement Criteria: *Document sources and agencies for licensing and certification and credentialing information including contact information.*

Statement: *Recognize the responsibilities and personal characteristics of a professional craftsman to develop personal goals for professionalism.*

Performance Element: Research workplace/jobsite information to identify appropriate craft responsibilities and personal characteristics.

Measurement Criteria: *Practice the responsibilities and characteristics of a professional craftsman.*

Measurement Criteria: *Identify all critical/important functions.*

Measurement Criteria: *Document customer satisfaction.*

Performance Element: Present a professional image in the workplace/jobsite to enhance career advancement.

Measurement Criteria: *Maintain appropriate professional memberships.*

Measurement Criteria: *Follow rules, regulations and guidelines.*

Statement: *Maintain a career portfolio to document knowledge, skills and abilities.*

Performance Element: Select educational and work history highlights to create a personal resume.

Measurement Criteria: *Develop a resume utilizing word processing technology.*

Performance Element: Contact professional references to acquire recommendations.

Measurement Criteria: *Obtain appropriate letters of recommendation.*

Performance Element: Maintain a record of work experiences, licenses, certifications and education to build a portfolio.

Measurement Criteria: *Document work experience.*

Measurement Criteria: *Document receipt of licenses, certifications and credentialing.*

Measurement Criteria: *Document completion of education and training.*

Architecture and Construction

Cluster Knowledge and Skill Statement

Technical Skills

Statement: *Read technical drawings and documents to plan a project.*

Performance Element: Interpret blueprints and drawings to assist with project planning.

Measurement Criteria: *Recognize elements and symbols of blueprints and drawings.*

Performance Element: Study written standards and specifications to apply them.

Measurement Criteria: *Interpret and explain standards and specifications.*

Performance Element: Recognize how specifications and standards are arranged to properly access and use them.

Measurement Criteria: *Describe and use specifications and standards appropriately.*

Performance Element: Use architect's plan, manufacturer's illustrations and other materials to visualize proposed work and to transfer specific data.

Measurement Criteria: *Sketch/draw/illustrate concepts and ideas.*

Measurement Criteria: *Draw or sketch plan/layout to be completed.*

Measurement Criteria: *Use proper measurements to determine layout.*

Performance Element: Conceptualize a three-dimensional form from a two-dimensional drawing to visualize proposed work.

Measurement Criteria: *Build three-dimensional form.*

Statement: *Use and maintain appropriate tools, machines and equipment to accomplish project goals.*

Performance Element: Select tools, machinery and equipment to match requirements of the job.

Measurement Criteria: *Operate tools, machinery and equipment.*

Measurement Criteria: *Properly maintain and care for tools, machines and equipment.*

Measurement Criteria: *Use tools, machine and equipment productively and efficiently in alignment with industry standards.*

Performance Element: Identify sources of information concerning state-of-the-art tools, equipment, materials, technologies and methodologies.

Measurement Criteria: *Read current periodicals, industry publications and manufacturer's catalogs.*

Measurement Criteria: *Use state-of-the-art tools, equipment, materials, technologies and methodologies.*

Section III – Pathway Knowledge and Skills

Architecture and Construction

PATHWAY: Design/Pre-Construction

Pathway Topic: Academics

Pathway KS Statement: *Employ basic methods of data collection and analysis to provide information for projects.*

Performance Element: Access research methods available to formulate project planning and problem-solving.

Measurement Criteria: *Select and employ proper method for a given project.*

Performance Element: Provide appropriate precedents for development of a project.

Measurement Criteria: *Articulate logical rationale for use of chosen precedents.*

Pathway Topic: Communications

Pathway KS Statement: *Work with potential clients.*

Performance Element: Give a speech to explain a concept.

Measurement Criteria: *Show project plans for visual impact.*

Measurement Criteria: *Evaluate customer comprehension.*

Performance Element: Facilitate a variety of clients and agencies.

Measurement Criteria: *Identify types of client/agency needs.*

Measurement Criteria: *Mediate diversity to meet needs.*

Pathway Topic: Systems

Pathway KS Statement: *Integrate structural systems, environmental systems, safety systems, building envelope systems and building service systems to design modern buildings..*

Performance Element: Assess building systems and their interrelationships to develop design criteria.

Measurement Criteria: *Select and integrate building systems.*

Pathway KS Statement: *Review traditional project phases and various roles within them to plan for and implement phases within a project..*

Performance Element: Relate traditional project phases and the various roles within them to a current project.

Measurement Criteria: *Work through project phases.*

Pathway Topic: Safety, Health, and Environmental

Pathway KS Statement: *Apply the basic principles of environmental impact to enhance project acceptance and quality.*

Performance Element: Evaluate and align sustainable design elements to add value to the project .

Measurement Criteria: *Integrate sustainable elements into project designs.*

Pathway KS Statement: *Apply design requirements to accommodate people with varying physical abilities.*

Performance Element: Study the Americans with Disabilities Act in order to build compliance into project designs.

Measurement Criteria: *Integrate Americans with Disabilities Act compliance into project designs.*

Pathway Topic: Leadership and Teamwork

Architecture and Construction

Pathway Topic: Leadership and Teamwork

Pathway KS Statement: *Appreciate the diversity of needs, values and social patterns in project design.*

Performance Element: Identify Western, non-Western, national and regional traditions and heritage to express diversity in project design as required.

Measurement Criteria: *Apply cultural traditions and diversity to project design.*

Pathway Topic: Technical

Pathway KS Statement: *Use drawings and computer-generated plans to develop a technical set of drawings.*

Performance Element: Identify client's needs and wants to develop criteria for a set of technical drawings.

Measurement Criteria: *Develop a set of technical drawings meeting the client's specifications.*

Pathway KS Statement: *Employ appropriate representational media to convey essential formal elements.*

Performance Element: Use two- and three-dimensional drawings to convey graphic information.

Measurement Criteria: *Employ basic drawing skills.*

Measurement Criteria: *Show three-dimensions in a two-dimensional drawing.*

Performance Element: Reference drawings and sketches to build models.

Measurement Criteria: *Employ basic model building techniques.*

Measurement Criteria: *Verify accuracy of model based on drawings and sketches used.*

Performance Element: Use appropriate computer technology to convey graphic information.

Measurement Criteria: *Employ basic computer modeling techniques.*

Pathway KS Statement: *Study principles, conventions, standards, applications and restrictions pertaining to the manufacture and use of construction materials, components and assemblies to incorporate into project design.*

Performance Element: Evaluate and select building materials and assemblies to meet project specifications.

Measurement Criteria: *Develop and communicate an assigned building assembly.*

Performance Element: Use appropriate combinations of building materials and components to satisfy the requirements of building programs.

Measurement Criteria: *Select the more appropriate building assembly.*

Pathway KS Statement: *Apply basic organizational, spatial, structural and constructional principles to the design of interior and exterior space.*

Performance Element: Develop design alternatives to address a given problem.

Measurement Criteria: *Evaluate and select the most appropriate solution.*

PATHWAY: Construction

Pathway Topic: Communications

Pathway KS Statement: *Recognize universal signs and symbols such as colors, flags, stakes and hand signals to function safely in the workplace.*

Performance Element: Identify universal signs and symbols to apply to given workplace situations.

Measurement Criteria: *Explain functions of signs and symbols.*

Measurement Criteria: *Work safely using signs and symbols.*

Measurement Criteria: *Inspect all signs and symbols for safe and proper use.*

Measurement Criteria: *Use proper signs and signals for the work area.*

Measurement Criteria: *Respond appropriately to signs and signals.*

Pathway Topic: Technical Skills

Pathway KS Statement: *Examine building systems and components to evaluate their usefulness to a project.*

Performance Element: Identify building systems needed to complete a construction project.

Measurement Criteria: *List all building systems involved in a project.*

Measurement Criteria: *Describe the purpose of each system.*

Performance Element: Identify components of building systems needed to complete a construction project.

Measurement Criteria: *List all components of the involved building system.*

Measurement Criteria: *Describe the function of each component.*

Performance Element: Incorporate appropriate building systems into a construction project.

Measurement Criteria: *Use appropriate components for the building systems required.*

PATHWAY: Maintenance/Operations

Pathway Topic: Communications

Pathway KS Statement: *Recognize universal signs and symbols such as colors, flags, stakes and hand signals to function safely in the workplace.*

Performance Element: Identify universal signs and symbols to apply to given workplace situations.

Measurement Criteria: *Explain functions of signs and symbols.*

Measurement Criteria: *Work safely using signs and symbols.*

Measurement Criteria: *Inspect all signs and symbols for safe and proper use.*

Measurement Criteria: *Use proper signs and signals for the work area.*

Pathway Topic: Problem Solving and Critical Thinking

Pathway KS Statement: *Use troubleshooting procedures to solve a maintenance problem.*

Performance Element: Troubleshoot to isolate a maintenance problem.

Measurement Criteria: *Identify the problem using at least one appropriate troubleshooting method.*

Performance Element: Select a solution to address the maintenance problem.

Measurement Criteria: *Identify strategies for implementing the solution.*

Measurement Criteria: *Identify tools and equipment needed.*

Performance Element: Use strategies, tools and equipment to implement the solution.

Measurement Criteria: *Use tools and equipment safely, effectively and efficiently.*

Measurement Criteria: *Test and verify that the problem is solved.*

Pathway Topic: Technical

Pathway KS Statement: *Apply construction skills to restoration of existing structures.*

Performance Element: Evaluate restoration problems to plan solutions.

Measurement Criteria: *Identify strategies for implementing solutions.*

Performance Element: Determine materials required to complete restoration.

Measurement Criteria: *Match materials selected to the restoration specifications.*

Performance Element: Implement restoration strategies to produce restored structure .

Measurement Criteria: *Restore structure to match original structure within specifications.*

Pathway KS Statement: *Evaluate the work required to repair existing structures.*

Performance Element: Use evaluation strategies to assess the extent and condition of any problems.

Measurement Criteria: *Identify potential sources of problems.*

Measurement Criteria: *Select the most probable cause of each problem.*

Performance Element: Identify tools, materials and human resources needed to complete the repair work.

Measurement Criteria: *Select tools and materials that will repair the problem*

Architecture and Construction

Pathway Topic: Technical

effectively and efficiently.

Measurement Criteria: *Employ individuals with the appropriate expertise to complete the repair work.*

Performance Element: **Complete the repair work to restore project to the original condition.**

Measurement Criteria: *Use tools and materials safely, effectively and efficiently.*

Measurement Criteria: *Test and verify that the repair is complete.*

Pathway KS Statement: **Practice preventative maintenance to service existing structures.**

Performance Element: **Develop a checklist to track preventative maintenance.**

Measurement Criteria: *Read and interpret technical manuals.*

Measurement Criteria: *Identify preventative maintenance needs for a variety of conditions.*

Measurement Criteria: *List maintenance needs for a variety of equipment, systems, and structures.*

Performance Element: **Identify tools and materials needed to perform preventative maintenance.**

Measurement Criteria: *Select and use tools and materials safely, effectively, and efficiently.*

Performance Element: **Establish time-based schedules to perform preventative maintenance.**

Measurement Criteria: *Follow a maintenance schedule.*

Measurement Criteria: *Complete and maintain preventative maintenance records.*

Pathway KS Statement: **Maintain and use operational systems to achieve smooth operation of facilities.**

Performance Element: **Maintain operations systems such as fire prevention, HVAC, security/alarm, environmental and process systems to meet safety and customer requirements.**

Measurement Criteria: *Read and interpret technical manuals.*

Measurement Criteria: *Apply information from technical manuals.*

Section IV – O*NET Crosswalk Report

Career Specialty/ Occupational Coding and Crosswalk

Summary

The objective of the Career Specialty/ Occupational Coding and Crosswalk project is to accomplish two basic tasks. The first is to design and establish a classification and coding structure for the States' Career Clusters Initiative. When completed, the classification and coding structure will be compatible with existing occupational classification systems and designed in a manner that allows for easy updating and the flexibility to add additional career pathways and occupational specialties.

Once the first step is completed for each cluster, the second step is to build a linkage system or crosswalk between the new career cluster classification system and the O*NET occupational classification system developed and operated by the U S Department of Labor. O*NET is a nationally recognized taxonomy with detailed descriptions and a rich database of information for each occupation.

Explanation of Crosswalk Table

The attached table lists each occupational specialty and its related O*NET occupation. It is sequenced by career pathway and occupational specialty code. It should be noted that the relationship between an occupational specialty and its related O*NET occupation is often not one-to-one. The O*NET occupation is often much broader covering two or more occupational specialties. In fact, even when multiple occupational specialties are assigned, they may only represent a part of a broader O*NET occupation.

Column 1: Lists occupational specialties that were identified by the Career Clusters Initiative. The occupational specialties are organized by cluster pathways and represent occupational titles with no definitions. They are intended to be a sample of occupations that help define the cluster and pathway.

Column 2: Represents related occupations from the O*NET occupational coding system.

Note: A crosswalk from the occupational specialties to the Classification of Instructional Programs (CIP) codes is forthcoming. The National Crosswalk Service Center is currently developing the CIP to O*NET crosswalk which will be the bridge to the career cluster occupational specialties. You may access this crosswalk in the near future at: <http://www.xwalkcenter.org/>

**Architecture and Construction Career Cluster: Occupational Specialties and Related O*NET Occupations
Sequenced by Career Pathways and Occupational Specialty Codes**

Occupational Specialties		Related SOC/O*NET Occupations	
Code	Title	Code	Title
2.10000	Design/Pre-construction Pathway		
2.10010	Architect	17-1011.00	Architects, Except Landscape and Naval
2.10020	Interior Designer	27-1025.00	Interior Designers
2.10030	Landscape Designer	17-1012.00	Landscape Architects
2.10040	Urban Planner/Designer	19-3051.00	Urban and Regional Planners
2.10050	Environmental Designer	17-1012.00	Landscape Architects
2.10060	Programmer	15-1021.00	Computer Programmers
2.10070	Preservationist	19-3051.00	Urban and Regional Planners
2.10080	Civil Engineer (structural, geotechnical, transportation, etc.)	17-2051.00	Civil Engineers
2.10090	Mechanical Engineer (HVAC, plumbing, fire protection, etc.)	17-2141.00	Mechanical Engineers
2.10100	Electrical Engineer (electronics, security, telecommunications)	17-2071.00	Electrical Engineers
2.10110	Environmental Engineer (hydro engineering, acoustical, etc.)	17-2081.00	Environmental Engineers
2.10120	Surveyor	17-1022.00	Surveyors
2.10130	Specifications Writer	27-3042.00	Technical Writers
2.10140	Building Code Official	47-4011.00	Construction and Building Inspectors
2.10150	Computer Information System Manager/Designer	11-3021.00	Computer and Information Systems Managers
2.10160	Computer Aided Drafter (CAD)	17-3013.00	Mechanical Drafters
2.10180	Modeler (traditional and computer)	51-7031.00	Model Makers, Wood
2.10180	Modeler (traditional and computer)	51-4061.00	Model maker, metal
2.10190	Renderer (traditional and computer)	99.0000.00	Insufficient information to classify
2.20000	Construction Pathway		
2.20010	General Contractor	11-9021.00	Construction Managers
2.20020	Specialty Contractor	11-9021.00	Construction Managers
2.20030	Construction Engineer	17-2051.00	Civil Engineers
2.20040	Construction Manager	11-9021.00	Construction Managers
2.20050	Superintendent	11-9021.00	Construction Managers
2.20060	Project Manager	11-9021.00	Construction Managers
2.20070	Construction Foreman	47-1011.01	First-Line Supervisors and Manager/Supervisors- Construction Trades

**Architecture and Construction Career Cluster: Occupational Specialties and Related O*NET Occupations
Sequenced by Career Pathways and Occupational Specialty Codes**

Occupational Specialties		Related SOC/O*NET Occupations	
Code	Title	Code	Title
2.20080	Estimator	13-1051.00	Cost Estimators
2.20090	Project Inspector	47-4011.00	Construction and Building Inspectors
2.20100	Project Engineer	17-2051.00	Civil Engineers
2.20110	Manufacturer's Representative	41-4012.00	Sales Representatives, Wholesale and Manufacturing, Except Technical
2.20110	Manufacturer's Representative	41-4011.00	Sales Representatives, Wholesale and Manufacturing, Technical and
2.20120	Sales and Marketing Manager	11-2022.00	Sales Managers
2.20120	Sales and Marketing Manager	11-2021.00	Marketing Managers
2.20130	Equipment and Material Manager	11-3061.00	Purchasing Managers
2.20130	Equipment and Material Manager	11-9021.00	Construction Managers
2.20140	Scheduler	11-9021.00	Construction Managers
2.20150	Education and Training Director/Coordinator	11-3042.00	Training and Development Managers
2.20150	Education and Training Director/Coordinator	13-1073.00	Training and Development Specialists
2.20160	Safety Director	11-9041.00	Engineering Managers
2.20170	Mason	47-2021.00	Brickmasons and Blockmasons
2.20180	Iron/Metalworker – structural and reinforcing	47-2221.00	Structural Iron and Steel Workers
2.20190	Carpenter/Millwright	47-2031.00	Carpenters
2.20200	Electrician	47-2111.00	Electricians
2.20210	Concrete Finisher	47-2051.00	Cement Masons and Concrete Finishers
2.20220	Glazer	47-2121.00	Glaziers
2.20230	Roofer	47-2181.00	Roofers
2.20240	Painter	47-2141.00	Painters, Construction and Maintenance
2.20250	Plasterer/Drywall	47-2161.00	Plasterers and Stucco Masons
2.20260	Plumber/Pipe Fitter	47-2152.00	Plumbers, Pipefitters, and Steamfitters
2.20270	Equipment Operator	47-2073.01	Grader, Bulldozer, & Scraper Operators
2.20270	Equipment Operator	47-2073.02	Operating Engineers
2.20280	Flooring System Mechanic/Technician	47-2043.00	Floor Sanders and Finishers
2.20290	Heating, Ventilation, Air Conditioning, Refrigeration Mechanic	49-9021.01	Heating & Air Conditioning Mechanics
2.20290	Heating, Ventilation, Air Conditioning, Refrigeration Mechanic	49-9021.02	Refrigeration Mechanics
2.20300	Craft Specialties (i.e. Floor Carpenter)	99.0000.00	Insufficient information to classify

**Architecture and Construction Career Cluster: Occupational Specialties and Related O*NET Occupations
Sequenced by Career Pathways and Occupational Specialty Codes**

Occupational Specialties		Related SOC/O*NET Occupations	
Code	Title	Code	Title
2.30000	Maintenance/Operations Pathway		
2.30010	General Maintenance Contractor	11-9021.00	Construction Managers
2.30020	Specialty Contractor	11-9021.00	Construction Managers
2.30030	Facilities Engineer	17-2051.00	Civil Engineers
2.30040	Reliability Engineer	17-2199.00	Engineers, All Other
2.30050	Environmental Engineer	17-2081.00	Environmental Engineers
2.30060	Demolition Engineer	17-2051.00	Civil Engineers
2.30070	Maintenance Planner/Scheduler	11-3011.00	Administrative Services Managers
2.30070	Maintenance Planner/Scheduler	43-5061.00	Production, Planning, and Expediting Clerks
2.30080	Maintenance Estimator	11-3011.00	Administrative Services Managers
2.30080	Maintenance Estimator	13-1051.00	Cost Estimators
2.30090	Security Controls Manager	33-1099.00	First-Line Supervisors/Managers, Protective Service Workers, All Other
2.30100	Mason	47-2021.00	Brickmasons and Blockmasons
2.30110	Iron/Metalworker – structural and reinforcing	47-2221.00	Structural Iron and Steel Workers
2.30120	Carpenter/Millwright	47-2031.00	Carpenters
2.30130	Electrician	47-2111.00	Electricians
2.30140	Concrete Finisher	47-2051.00	Cement Masons and Concrete Finishers
2.30150	Glazer	47-2121.00	Glaziers
2.30160	Roofer	47-2181.00	Roofers
2.30170	Painter	47-2141.00	Painters, Construction and Maintenance
2.30180	Plasterer/Drywall	47-2161.00	Plasterers and Stucco Masons
2.30190	Plumber/Pipe Fitter	47-2152.00	Plumbers, Pipefitters, and Steamfitters
2.30200	Equipment Operator	47-2073.01	Grader, Bulldozer, & Scraper Operators
2.30200	Equipment Operator	47-2073.02	Operating Engineers
2.30210	Flooring System Mechanic/Technician	47-2043.00	Floor Sanders and Finishers
2.30220	Heating, Ventilation, Air Conditioning, Refrigeration Mechanic	49-9021.01	Heating & Air Conditioning Mechanics
2.30230	Refractory Technician	47-4099.00	Construction & Related Workers, All Other
2.30240	Hydro Testing Technician	17-3022.00	Civil Engineering Technicians
2.30250	Thermal Control Technician	17-3022.00	Civil Engineering Technicians
2.30260	Restoration Technician	17-3022.00	Civil Engineering Technicians

**Architecture and Construction Career Cluster: Occupational Specialties and Related O*NET Occupations
Sequenced by Career Pathways and Occupational Specialty Codes**

Occupational Specialties		Related SOC/O*NET Occupations	
Code	Title	Code	Title
2.30270	Wastewater Maintenance Technician	17-3025.00	Environmental Engineering Technicians
2.30270	Wastewater Maintenance Technician	17-3022.00	Civil Engineering Technicians
2.30280	Highway Maintenance Worker	47-4051.00	Highway Maintenance Workers
2.30290	Landscape Maintenance/Groundskeeper	37-3011.00	Landscaping and Groundskeeping Workers
2.30300	Craft Specialties (i.e. Refractory Brick)	99-0000.00	Insufficient information to classify

Section V – Cluster Profile Advisory Committee List

Career Cluster Profile

Cluster Name: Architecture and Construction

Project Lead State: Pennsylvania

Project Lead State Contact Information:

K.C. Simchock, Project Lead
Pennsylvania Dept. of Education
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John C. Foster, State Director
Pennsylvania Dept. of Education
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Harrisburg, PA 17126-0333
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Cluster Coordinator: Pam Stacey

Cluster Definition: Careers in designing, planning, managing, building and maintaining the built environment.

Cluster Pathways: Design/Pre-Construction; Construction; Maintenance/Operations

Cluster Partners: List attached. (A number of associations and government agencies represent business, industry, labor, and education.)

Number of cluster partners in each of the following categories:

Postsecondary Education:	<u>6</u>
Secondary Education:	<u>2</u>
Business & Industry:	<u>6</u>
Labor:	<u>4</u>
Associations:	<u>14</u>
Government Agencies:	<u>13</u>

Deliverable #1: Architecture and Construction Cluster Advisory Committee Members

(Names of Executive Committee members are indicated in bold.)

Updated 8/20/02

Name	Job Title	Organization/ Company/School	Address	City	State, ZIP	Phone	E-Mail	Pathway
Anderson, Marcy	Manager of Training Solutions	Zachry Construction Corporation	1499 Underwood Road	La Porte	TX 77571-9469	(281) 604-2200, x239	andersonmarcy@netscape.net	maint./oper.
Anderson, Pam	Owner	Anderson Construction	7778 Grindstone Hill Road	Chambersburg	PA 17201-8524	(717) 597-1345	panderson@innernet.net	construction
Bicanich, Patricia	Project Director	Penn State McKeesport Education Resource Center	4000 University Drive	McKeesport	PA 15132-7698	(412) 675-9065	pjb17@psu.edu	all
Brunning, Robert	Principal/Owner	TEAM Construction Consulting LLC	9207 Powderhorn Drive	Fountain Hills	AZ 85268-6516	(602) 481-0365	bdbrunning@msn.com	construction
Bullock, Larry	Program Specialist	Oklahoma Department of Career & Technical Education	1500 West Seventh Avenue	Stillwater	OK 74074-4364	(405) 743-5147	lbull@okcareertech.org	construction
Burket, Lee	Assistant Director	Admiral Peary AVTS	948 Ben Franklin Highway	Ebensburg	PA 15931-7618	(814) 472-6490	lburket@admiralpeary.tec.pa.us	construction
Camacho, Esther	Director for Trade and Industrial Education	Texas Department of Ed	1701 North Congress Avenue - HP 455	Austin	TX 78701-1494	(512) 463-9397	ycamacho@tea.state.tx.us	maint./oper.
Cathey, Ellen Scanlan	Director of Education	American Institute of Architects	1735 New York Avenue NW	Washington	DC 20006-5292	(202) 626-7417	ecathey@aia.org	design/pre-construct.
Clemens, James	Chairman of the Board	Clemens Construction Co. Inc./United of Brotherhood	1435 Walnut Street 7th Floor	Philadelphia	PA 19102-3219	(215) 567-5757	Sdclemens10@cs.com	construction
Condit, Richard	Sr VP and Chief Human Res Officer	Sundt Construction, Inc.	1501 West Fountainhead Pkwy - Suite 600	Tempe	AZ 85282-1873	(480) 293-3000	rbcondit@sundt.com	construction
Conroy, Matt	Education to Career Specialist	Palm Bay High School	101 Pirate Lane	Melbourne	FL 32901-8699	(321) 952-5923	conroy@m.brevard.k12.fl.us	design/pre-construct. construction

Name	Job Title	Organization/ Company/School	Address	City	State, ZIP	Phone	E-Mail	Pathway
Day, Fred	Director of Craft Training	Associated Builders and Contractors	1300 North 17th St. - Suite 800	Rosslyn	VA 22209-3804	(703) 812-2003	day@abc.org	construction
Dickson, Eileen	Director of Education	National Ready Mixed Concrete Association	900 Spring Street	Silver Spring	MD 20910-4057	(301) 587-1400 x 119	Edickson@NRMCA.org	maint./oper.
Dixon, Daniele	Curricula Revision & Development Dir	National Cntr for Construction Education and Research	PO Box 141104	Gainesville	FL 32614-1104	(352) 334-0911	ddixo@nccer.org	construction
Eivins, Terry	Apprenticeship and Training Director	Construction Training School of St Louis	6301 Knox Industrial Drive	St Louis	MO 36139-3094	(314) 644-1525	teivins@stl-cts.org	construction
Fernandez, Thomas	Vice President	American Institute of Architects	1014 Vine Street Suite 2100	Cincinnati	OH 45202-1151	(513) 381-2112	tfernandez@shpinc.com	design/pre-construct.
Foster, John	Director	PA Dept of Education Bureau of Career & Tech Education	333 Market Street 6th Floor	Harrisburg	PA 17126-0333	(717) 787-5530	jofoster@state.pa.us	construction
Franks, Stephen	Dir of Workforce Education	Arkansas Department of Education	Luther Hardin Building/Three Capitol Mall	Little Rock	AR 72201-1083	(501) 682-1500	steve.franks@mail.state.ar.us	construction
Fraser, Jeannette	Tech Prep Coordinator	Pennsylvania College of Technology	One College Avenue	Williamsport	PA 17701-5799	(570) 320-8003	jfraser@pct.edu	maint./oper.
Gillespie, Tony	Tech Prep Coordinator	Lancaster County Career Center	1730 Hans Herr Drive PO Box 572	Willow Street	PA 17584-9112	(717) 464-7059	agillespie@lcctc.org	construction
Glenn, Tony	Industrial Technology Education Dir	Nebraska Department of Education	301 Centennial Mall South PO Box 94987	Lincoln	NE 68509-4987	(402) 471-4819	tglenn@nde.state.ne.us	maint./oper.
Headrick, Nancy	Assistant Commissioner	Department of Elementary & Secondary Education	250 W Jefferson Street - 5th Fl PO Box 480	Jefferson City	MO 65102-0408	(573) 751-2660	nheadrick@mail.dese.state.mo.us	construction
Heffner, John	Executive Director	Associated General Contractors of America	333 John Carlyle Street - Suite 200	Alexandria	VA 22314-5745	(703) 837-5333	heffnerj@agc.org	construction

Name	Job Title	Organization/ Company/School	Address	City	State, ZIP	Phone	E-Mail	Pathway
Himes, Sandy	Academics & Special Programs Asst Dir	Lehigh Career and Technical Institute	4500 Education Park Drive	Schnecksville	PA 18078-2599	(610) 799-1358	himes@lcti.org	construction
Kube, Tom	Executive Dir/CEO	Council of Education Facility Planners	9180 E Desert Cove-104 Airdustrial Pk Bldg 17	Scottsdale	AZ 85260-6254	(480) 391-0840	tom@cefpi.org	design/pre-construct.
Kutzer, Wayne	Vocational Tech Education State Dir	State Board of Vocational Technical Education	600 East Boulevard Ave. Dept 270	Bismarck	ND 58505-0610	(701) 328-2259	wkutzer@state.nd.us	construction
Landry, Mark	Dir of Human Resources	Fluor Global Services/Operation and Maintenance	100 Fluor Daniel Drive	Greenville	SC 29607-2761	(864) 281-5661	mark.landry@fluor.com	construction
Martin, BT	Education Associate	South Carolina Department of Education	1429 Senate St. 915-A Rutledge Office Bldg	Columbia	SC 29201-3730	(803) 734-3398	btmartin@sde.state.sc.us	design/pre-construct. construction
McInerney, Bernie	Statewide Tech Prep Coordinator	New York State Department of Education	89 Washington Avenue Room 319EB	Albany	NY 12234-0001	(518) 474-8940	bmcinern@mail.nysed.gov	maint./oper.
Mittelsteadt, Sandy	Executive Director	National Career Academy Coalition	315 East 18th Street	Bakersfield	CA 93305-5610	(661) 900-7822	samitte@zeus.kern.org	construction
Morehead, Ronald	Training Coordinator	AFL-CIO	82 South Second Street - Suite 200	Springfield	IL 62704-2699	(271) 525-6678	terrip@ilafl-cio.org	construction
Penny, James	Chief of Division of Standards and National Industry Promotion	United States Department of Labor	200 Constitution Avenue NW	Washington	DC 20210-0002	(202) 693-3812	jlpenny@doleta.gov	construction
Rinehart, Michelle	Senior Project Manager	Association of Collegiate Schools of Architecture	1735 New York Avenue NW	Washington	DC 20006-5270	(202) 785-2324	mrinehart@acsa-arch.org	design/pre-construct.
Scheerz, Tony	Director of Training	Wyoming Contractors Association	PO Box 50568	Casper	WY 82605-0568	(307) 237-4400	tscheerz@vcn.com	construction
Silverman, Alan	Associate Supervisor	New York State Department of Education	89 Washington Avenue Room 320EB	Albany	NY 12234-1000	(518) 486-7348	asilverm@mail.nysed.gov	construction

Name	Job Title	Organization/ Company/School	Address	City	State, ZIP	Phone	E-Mail	Pathway
Simchock, KC	Lead State Cluster Coordinator	PA Dept of Education Bureau of Career & Tech Education	333 Market Street 6th Floor	Harrisburg	PA 17126-0333	(717) 787-8804	ksimchock@ state.pa.us	all
Spieker Slaughter, Sally	Tech Prep Coordinator	University of Alaska	3211 Providence Drive	Anchorage	AK 99508-8000	(907) 786-6498	sally_spieker@ uaa.alaska.edu	maint./oper.
Stacey, Pam	Career Clusters' Coordinator	States' Career Cluster Initiative	1500 West 7th Avenue	Stillwater	OK 74074-4364	(405) 743-6850	pstac@career clusters.org	all
Steffian, Peter	Principal	National Council of Architectural Registration Boards	1801 K Street NW - Suite 110	Washington	DC 20006-1315	(202) 783-6500	psteffian@ steffian.com	design/pre-construct.
Stevens, Jean	Assistant Commissioner	New York State Department of Education	89 Washington Avenue Room 319EB	Albany	NY 12234-1000	(518) 474-8892	jstevens@mail. nysed.gov	all
Tanner, Ron (Chair)	President & Treasurer	Construction & Improvement Specialty Co., Inc.	PO Box 71865 3006 Dodds Avenue	Chattanooga	TN 37407-1630	(423) 698-8825	ron@c-i-general contractors.com	construction
Tippie, John	Associate Director	Laborers-AGC Education and Training Fund	27055 Ohio Avenue	Kingston	WA 98346-8604	(360) 297-4152	jtippie@laborers- agc.org	construction
Walter, Richard	Professional Personnel Dev Center Director	Penn State University	301 Keller Building	State College	PA 16802-1014	(814) 865-2133	raw18@psu.edu	construction
Whyte, Don	Vice President	National Center for Construction Education & Research	PO Box 141104	Gainesville	FL 32614-1104	(352) 334-0911	Dwhyte@ nccer.org	maint./oper.
Widdowson, Jeri	Executive Director	SkillsUSA State Director	409G Keller Building	State College	PA 16802-1014	(814) 863-4523	bjw14@psu.edu	construction

Section VI – Credentials

Deliverable #2: Architechure and Construction Sample List of Existing Credentials (includes licenses, education and industry certificates, as well as postsecondary degree options)

Updated 08/19/02

Education and Industry <i>Licenses</i>			
Pathway	Title/Type/Descriptor of Liscensing Program	Licensing Organization	Source for Contact Information
PC, C, MO	Information provided by states	Construction Licensing Institute	www.gcexams.com
PC, C, MO	Information provided by states	Contractors License Reference Site	www.contractor-license.org
PC, C, MO	Information provided by states	Examination and Licensing Cervices	www.experioronline.com
PC, C, MO	Information provided by states	National Association of State Contractors Licensing Agencies	www.nascla.org
PC, C, MO	Information provided by states		www.constructionweblinks.com/Industry_Topics/ Licensing__Industry_Topics/licensing__industry_topics.html

Pathway Descriptors -- PC = Pre-Construction/Design C = Construction MO = Maintenance/Operation

Architecture and Construction

Education and Industry Certificates			
Pathway	Title/Type/Descriptor of Certification Program	Issuing Organization	Source for Contact Information
C, MO	ACI Field Technician Certification Program	American Concrete Institute	www.aci-int.org/
PC	ACSM Educational & Certification Program	American Congress on Surveying and Map	www.acsm.net/edu.html
PC, C, MO	Adult/Continuing Education	Northeastern University	www.neu.edu/continued.html
PC	AICP	American Planning Association	www.planning.org/abtaicp/abtaicp.html
C	AISC Quality Certification program	American Institute of Steel Constructors	www.aise.org/quality.asp?ar=15&co=18
C	American Society of Plumbing Engineers (ASPE)	American Society of Plumbing Engineers	www.aspe.org/CIPE/cipe.html
PC, C, MO	API E&I Pipeline Technician	National Center for Construction Education and Research	www.nccer.org
C	Architectural Hardware Consultant (AHC)	Door and Hardware Institute	www.dhi.org/consult/seal_program.htm
C	Architectural Precast Concrete	Architectural Precast Association	www.archprecast.org/plant.htm
PC, C	ASME Continuing Education Institute	American Society of Mechanical Engineers	www.asme.org/education/
PC	ASNT Certification Programs	American Society for Nondestructive Testing	www.asnt.org/certification/certification.htm
PC, C, MO	ASU Education Certifications	Arizona State University	www.google.com/u/arizonastate?q=certification&domains=asu.edu&site=search=asu.edu
PC, C, MO	Boilermaking	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Boilermaking Technician	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Certificate Programs	University of Wyoming	www.uwyp.edu/uwcc/certificates.htm
PC, C, MO	Certified Building Official (CBO)	International Code Council	www.intlcode.org/certification/choinfo.htm
PC, C, MO	Certified Construction Manager (CCM)	Construction Management Association of America	www.cmaanet.org/
PC, C, MO	Certified Energy Manager Certification	Association for Energy Engineers	www.aeecenter.org/certification/
PC, C	Certified Ground Water Professional	National Ground Water Association	www.ngwa.org/certification/certification.html
MO	Certified Plant Engineer	Association for Facilities Engineering	www.afe.org/
C	Certified Professional Constructor	American Institute of Constructors	www.aicnet.org/membership/cpcintro.htm
PC, C	Certified Professional in Erosion and Sediment Control	International Erosion Control Association	www.ieca.org/public/articles/index.cfm?cat=25
C	Certified Welding Engineer	American Welding Society	www.aws.org/certification/certFP.html
C	Coating Inspector		
C	Cathodic Protection Certification	NACE	http://nace.org/nace/content/Education/EducationIndex.asp
PC, C, MO	Commercial Carpentry	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Commercial Electrical	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Corrosion Prevention Pipeline Technician	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Craft Instructor	National Center for Construction Education and Research	www.nccer.org
C	Crane Simulation Training	North American Crane Bureau	www.cranesafe.com/simulation.htm
C	CSI Certification Programs	Construction Specifications Institute	www.csinet.org/certify/index.htm
PC, C, MO	Engineering Technician Certification	National Institute for Certification in Engineering Technology	www.nicet.org/techprog.shtml
C, MO	EPA Technician Certification	Air Conditioning and Refrigeration Institute	www.ari.org/edu/#epaexam

Pathway Descriptors -- PC = Pre-Construction/Design C = Construction MO = Maintenance/Operation

Architecture and Construction

PC, C, MO	Field & Control Center Operations Technician	National Center for Construction Education and Research	www.nccer.org
MO	Geothermal Heat Pump and Training Certification Section 608 Refrigerant Transition and Recovery Certification	Air Conditioning Contractors of America	www.acca.org/education/educat.asp
PC, C, MO	GSE Departments & Programs	State University of New York at Buffalo	www.gse.buffalo.edu/DC/LAI/lai_degprog.htm
PC, C, MO	Hazardous Waste Management	University of Massachusetts	http://continuinged.uml.edu/certificates/m_hazardouswaste.asp
PC, C, MO	ICBO Code Central	International Conference of Building Officials	www.icbo.org/certification/
PC, C, MO	Industrial Carpentry	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Industrial Electrical	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Industrial Insulation	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Industrial Ironworking	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Industrial Maintenance Electrician	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Industrial Maintenance Mechanic	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Industrial Painting	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Industrial Pipefitter	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Instrument Fitter	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Instrument Technician	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Management Education Instructor	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Master Instructor	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Master Trainer	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Mechanical Pipeline Technician	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Millwright	National Center for Construction Education and Research	www.nccer.org
PC	National Commission for Certifying Agencies (NCCA)	National Commission for the Certification of Crane Operators	www.nccco.org/why/
C	National Contract Management Association	National Contract Management Association	www.ncmahq.org/prodev/certification/certification.html
PC, C, MO	National Safety Council	National Safety Council	www.nsc.org/train/top.htm
C, MO	National Training School (NTS)	National Burglar and Fire Alarm Association	www.alarm.org/industry/Training/training.html
PC, C, MO	Performance Evaluator	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Pipeline Maintenance Technician	National Center for Construction Education and Research	www.nccer.org
PC	Pneumatic Mechanic, Technician	Fluid Power Society	www.ifs.org/Certification/certification.htm
PC, C	Project Management Institute	Project Management Institute	www.pmi.org/certification/
C	Registered Roof Consultant Registered Roof Observer	Roof Consultants Institute (RCI)	www.rci-online.org/prog-regist.htm
C	RETA	Refrigerating Engineers and Technicians Association	www.reta.com/cert.html
PC, C, MO	Safety Master Trainer	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Safety Supervisor	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Safety Technician	National Center for Construction Education and Research	www.nccer.org
PC, C, MO	Scaffold Builder	National Center for Construction Education and Research	www.nccer.org

Pathway Descriptors -- PC = Pre-Construction/Design C = Construction MO = Maintenance/Operation

Architecture and Construction

PC, C	SME	Society of Manufacturing Engineers	www.sme.org/cgi-bin/certhtml.pl/?cert/certification.html&&sme
C	SSPC Certification Programs	Society for Protective Coating	www.sspc.org/site/cert.html
PC, C	Survey Technician Certification Program	National Society of Professional Surveyors	www.acsm.net/nsps/nspstech.html
C, MO	Training and Certification Program for Installers of Residential and Light Commerical Windows and Exterior Glass Doors	American Arch Manufactures Association	www.aamanet.org/im_menu.htm
PC, C	Transportation Profession Certification	Institute of Transportation Engineers	www.ite.org/certification/index_automatic_count.asp
C, MO	UL On-line Certifications	Underwriters Labortories, Inc	www.ul.com/customers/index.html
PC, C, MO	UW Extension Certified Programs	University of Washington	www.outreach.washington.edu/extinfo/certprog.asp
C	Voluntary Plumbing Inspector Certification Voluntary Mechanical Inspector Certification	International Association of Plumbing and Mechanical Officials	www.iapmo.org/iapmo/certification.html

Pathway Descriptors -- PC = Pre-Construction/Design C = Construction MO = Maintenance/Operation

Postsecondary Degree Options			
Pathway	Title/Type/Descriptor of Degree Program	Degree Conferring Organization	Source for Contact Information
PC	Architechural Engineering	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs_Colleges_U/Architectural_Engineering_Gra/architectural_engineering_gra.html
PC	Architechure	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs_Colleges_U/Architecture_Graduate_Program/architecture_graduate_program.html
PC	Architecture	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Engineering_Colleges_Univers/engineering_colleges_univers.html
	Chemical Engineering	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs_Colleges_U/Chemical_Engineering/chemical_engineering.html
PC, C	Civil Engineering	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs_Colleges_U/Civil_Engineering/civil_engineering.html
C	Construction Engineering and Management	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs_Colleges_U/Construction_Engineering_and_M/construction_engineering_and_m.html
C	Construction Management	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Architecture_Colleges_Univer/architecture_colleges_univer.html
PC, C	Electrical Engineering	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs_Colleges_U/Electrical_Engineering/electrical_engineering.html
PC, C	Energy and Power Management	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs_Colleges_U/Energy_Power_Management/energy_power_management.html
PC, C	Energy Management and Policy	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs_Colleges_U/Energy_Management_and_Policy/energy_management_and_policy.html
PC, C	Engineering	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Construction_Management_Colle/construction_management_colle.html
PC	Engineering Design	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs_Colleges_U/Engineering_Design/engineering_design.html
C, MO	Engineering Management	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs_Colleges_U/Engineering_Management/engineering_management.html

Pathway Descriptors -- PC = Pre-Construction/Design C = Construction MO = Maintenance/Operation

PC	Geotechnical Engineering	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs__Colleges__U/Geotechnical_Engineering/geotechnical_engineering.html
PC, C, MO	Landscape Architecture	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs__Colleges__U/Landscape_Architecture/landscape_architecture.html
PC, C	Mechanical Engineering	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs__Colleges__U/Mechanical_Engineering/mechanical_engineering.html
PC	Mineral and Mining Engineering	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs__Colleges__U/Mineral__Mining_Engineering/mineral__mining_engineering.html
PC, C	Structural Engineering	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs__Colleges__U/Structural_Engineering/structural_engineering.html
PC, C	Surveying	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs__Colleges__U/Surveying/surveying.html
PC, C	Transportation and Highway Engineering	College or University	http://www.constructionweblinks.com/Organizations/Colleges_and_Universities/Graduate_Programs__Colleges__U/Transportation_and_Highway_Eng/transportation_and_highway_eng.html

Pathway Descriptors -- PC = Pre-Construction/Design C = Construction MO = Maintenance/Operation

Section VII – Validation Overview/ Results



VALIDATION REPORT

Background

Cluster advisory committees made up of business and industry representatives, secondary/postsecondary educators, associations/organizations, government agencies and other stakeholders developed and conducted an initial review of the knowledge and skills statements. From July 15, 2002 through August 15, 2002, the States' Career Clusters Initiative conducted a national online validation of the knowledge and skill statements. The validation rated the degree of commonality and importance of each statement (see tables below). Each Cluster Committee reviewed the knowledge and skill ratings as well as any written responses to a particular statement. Likewise, each committee determined the appropriate action to take with regard to this data.

Cluster Question:

Question #1 : Is the knowledge and skill statement common to all occupations across the cluster ?	Question #2 : Is the knowledge and skill statement important to workplace success and/or further education ?
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Pathway Question:

Question #1 : Is the knowledge and skill statement common to all occupations across the pathway ?	Question #2 : Is the knowledge and skill statement important to workplace success and/or further education ?
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Rating Key:

Question #1: <input type="checkbox"/> Don't Know -N/A <input type="checkbox"/> Common to a few (25% or less) <input type="checkbox"/> Common to some (25 - 50%) <input type="checkbox"/> Common to many (51 - 75%) <input type="checkbox"/> Common to most (76 - 100%)	Question #2: <input type="checkbox"/> Don't Know -N/A <input type="checkbox"/> Not important <input type="checkbox"/> Somewhat important <input type="checkbox"/> Important <input type="checkbox"/> Critical
--	---

General Validation Statistics for the Eleven Clusters

Total Number of Respondents: 1133 completed profiles, 828 completed validation

Number of States/Others Represented: All 50 states/5 other

Overall profiles of respondents:

Organization Type

Business/Industry – 17.3 %

State Agency – 13.4 %

Federal Agency – 2.4 %

Association – 6.2 %

Secondary Education – 36.5 %

Postsecondary Education – 14.1 %

Other – 10.1 %

Average # of Years of Experience: 18.3 years

Architecture and Construction Cluster Validation Statistics

Total Number of Respondents: 69

Number of States/Others Represented: 22

Overall profiles of respondents:

Organization Type

Business/Industry – 21.7 %

State Agency – 14.5 %

Federal Agency – 3.0 %

Association – 4.3 %

Secondary Education – 43.5 %

Postsecondary Education – 8.7 %

Other – 4.3 %

Average # of Years of Experience: 22.1 years

Cluster Responses

Ratings of "Don't Know" are not included in this report.

Question #1: Is the knowledge and skill statement common to all occupations across the cluster?

Question #2: Is the knowledge and skill statement important to workplace success and/or further education?

StatementCode	StatementDescription	# Rsps	Q1 Avg	Q1=1	Q1=2	Q1=3	Q1=4	Q2 Avg	Q2=1	Q2=2	Q2=3	Q2=4
Cluster: Architecture and Construction												
ACC01.01	Perform math operations to complete jobsite/workplace tasks such as estimating and distributing materials and supplies.	57	3.63	0	3	15	39	3.60	0	1	21	35
ACC01.02	Perform physics skills to work with materials and load applications.	56	2.71	7	18	15	16	2.75	3	18	25	10
ACC01.03	Apply the principles of chemistry to manage workplace/jobsite materials safely.	57	1.89	21	23	11	2	2.26	7	33	12	5
ACC01.04	Read, understand and respond to English language technical and workplace documents to effectively function in the workplace/jobsite.	56	3.68	0	4	10	42	3.57	0	2	20	34
ACC01.05	Write clear and effective English to prepare workplace/jobsite information.	55	3.33	2	9	13	31	3.22	1	7	26	21
ACC02.01	Use and follow industry specific verbal and visual skills to accomplish workplace/jobsite communications.	54	3.74	0	1	12	41	3.56	0	0	24	30
ACC02.02	Listen to and speak with a variety of individuals to enhance communication skills.	56	3.50	0	5	18	33	3.30	0	4	31	21
ACC02.03	Exhibit public relation skills to address a variety of situations such as increasing internal and external customer/client satisfaction.	56	2.98	2	11	29	14	2.93	1	16	25	14
ACC03.01	Identify the relationship between available resources and requirements of a project/problem to accomplish realistic planning.	57	3.05	5	9	21	22	3.21	0	9	27	21
ACC03.02	Evaluate and adjust plans/schedules to respond to unexpected events and conditions.	57	3.16	4	6	24	23	3.30	3	2	27	25
ACC03.03	Synthesize and report conditions to keep the organization appraised of progress and problems.	56	2.93	8	9	18	21	3.14	1	11	23	21

StatementCode	StatementDescription	# Rsps	Q1 Avg	Q1=1	Q1=2	Q1=3	Q1=4	Q2 Avg	Q2=1	Q2=2	Q2=3	Q2=4
ACC05.01	Comply with governmental regulations and applicable codes to establish a legal and safe workplace/jobsite.	56	3.43	5	3	11	37	3.68	1	1	13	41
ACC05.02	Examine relationship of roles and responsibilities between trades/professions to complete a project/job.	56	2.98	5	11	20	20	3.04	1	13	25	17
ACC05.03	Examine all aspects of the built environment and its' systems to complete project planning.	54	2.69	10	11	19	14	2.83	3	13	28	10
ACC05.04	Apply industry standards and practices for quality to ensure quality work.	57	3.63	1	4	10	42	3.61	0	5	12	40
ACC06.01	Observe rules and regulations to comply with personal and jobsite safety standards.	57	3.81	0	1	9	47	3.77	0	2	9	46
ACC07.01	Establish specific goals to manage project assignments in a timely manner.	57	3.11	5	9	18	25	3.28	0	5	31	21
ACC07.02	Effectively resolve conflicts with co-workers to maintain a smooth workflow.	57	3.33	2	8	16	31	3.35	0	4	29	24
ACC07.03	Work as an individual and as a team member to accomplish assignments.	56	3.64	0	3	14	39	3.61	0	1	20	35
ACC07.04	Use mentoring skills to inspire others to achieve.	57	2.75	7	15	20	15	2.88	2	10	38	7
ACC08.01	Exhibit personal accountability, integrity and responsibility to enhance confidence among co-workers.	55	3.58	1	5	10	39	3.40	1	2	26	26
ACC08.02	Read regulations and contracts to ensure ethical and safety elements are observed.	56	2.71	9	16	13	18	3.25	1	8	23	24
ACC08.03	Use ethical and legal standards to avoid conflicts of interest.	56	2.70	13	8	18	17	3.09	1	9	30	16
ACC08.04	Examine legal and ethical relationships between employees and employers to establish workplace/jobsite rules, regulations and guidelines.	56	2.41	17	13	12	14	2.95	1	15	26	14
ACC09.01	Exhibit a positive work ethic to comply with employment requirements.	56	3.68	1	2	11	42	3.54	0	3	20	33

StatementCode	StatementDescription	# Rsps	Q1 Avg	Q1=1	Q1=2	Q1=3	Q1=4	Q2 Avg	Q2=1	Q2=2	Q2=3	Q2=4
ACC09.03	Recognize requirements for career advancement to plan for continuing education and training.	55	3.13	3	10	19	23	3.09	1	10	27	17
ACC09.04	Examine licensing, certification and credentialing requirements at the national, state and local levels to achieve compliance.	56	2.70	13	7	20	16	3.07	1	12	25	18
ACC09.05	Recognize the responsibilities and personal characteristics of a professional craftsperson to develop personal goals for professionalism.	56	3.02	5	11	18	22	3.00	3	10	27	16
ACC09.06	Maintain a career portfolio to document knowledge, skills and abilities.	55	2.51	11	16	17	11	2.58	3	24	21	7
ACC10.01	Read technical drawings and documents to plan a project.	56	3.11	7	4	21	24	3.54	0	2	22	32
ACC10.02	Use and maintain appropriate tools, machines and equipment to accomplish project goals.	56	3.68	0	1	16	39	3.75	0	0	14	42
Totals:		1737	3.14	164	256	498	819	3.23	35	252	727	723

Pathway Response

Ratings of "Don't Know" are not included in this report.

Question #1: Is the knowledge and skill statement common to all occupations within the pathway?

Question #2: Is the knowledge and skill statement important to workplace success and/or further education?

StatementCode	StatementDescription	# Rsp	Q1 Avg	Q1=1	Q1=2	Q1=3	Q1=4	Q2 Avg	Q2=1	Q2=2	Q2=3	Q2=4
Cluster: Architecture and Construction		Pathway: Design/Pre-Construction										
ACPA01.01	Employ basic methods of data collection and analysis to provide information for projects.	25	2.88	3	5	9	8	3.24	0	3	13	9
ACPA02.01	Work with potential clients.	25	2.72	3	7	9	6	3.12	0	5	12	8
ACPA03.01	Integrate structural systems, environmental systems, safety systems, building envelope systems and building service systems to design modern buildings..	24	3.00	3	3	9	9	3.38	0	2	11	11
ACPA03.02	Review traditional project phases and various roles within them to plan for and implement phases within a project..	24	2.75	4	4	10	6	3.08	0	6	10	8
ACPA04.01	Apply the basic principles of ecology, sustainability and "green design" to enhance project acceptance and quality.	23	2.04	7	8	8	0	2.65	1	8	12	2
ACPA04.02	Apply design requirements to accommodate people with varying physical abilities.	25	2.84	3	5	10	7	3.32	0	1	15	9
ACPA05.01	Appreciate the diversity of needs, values and social patterns that characterize various cultures in order to express diversity in project design.	25	2.32	7	5	11	2	2.44	4	8	11	2
ACPA06.01	Use drawings and computer-generated plans to develop a technical set of drawings.	24	3.25	3	0	9	12	3.46	0	0	13	11
ACPA06.02	Employ appropriate representational media to convey essential formal elements.	22	2.59	3	5	12	2	2.68	0	8	13	1
ACPA06.03	Study principles, conventions, standards, applications and restrictions pertaining to the manufacture and use of construction materials, components and assemblies to incorporate into project design.	23	3.00	2	3	11	7	3.35	0	0	15	8
ACPA06.04	Apply basic organizational, spatial, structural and constructional principles to the design of interior and exterior space.	25	2.92	2	6	9	8	3.24	0	2	15	8

StatementCode	StatementDescription	# Rsp	Q1 Avg	Q1=1	Q1=2	Q1=3	Q1=4	Q2 Avg	Q2=1	Q2=2	Q2=3	Q2=4
Cluster: Architecture and Construction		Pathway: Construction										
ACPB01.01	Recognize universal signs and symbols such as colors, flags, stakes and hand signals to function safely in the workplace.	38	3.32	2	5	10	21	3.42	0	4	14	20
ACPB02.01	Examine building systems and components to evaluate their usefulness to a project.	39	2.49	10	8	13	8	2.79	2	11	15	10
Cluster: Architecture and Construction		Pathway: Maintenance/Operation										
ACPC01.01	Recognize universal signs and symbols such as colors, flags, stakes and hand signals to function safely in the workplace.	21	3.19	1	4	6	10	2.95	1	3	9	7
ACPC02.01	Use troubleshooting procedures to solve a maintenance problem.	20	3.50	1	0	7	12	3.55	0	0	9	11
ACPC03.01	Apply construction skills to restoration of existing structures.	20	3.00	2	5	4	9	3.10	0	4	10	6
ACPC03.02	Evaluate the work required to repair existing structures.	20	3.10	2	3	6	9	3.20	0	2	12	6
ACPC03.03	Practice preventative maintenance to service existing structures.	20	3.15	1	3	8	8	3.25	0	2	11	7
ACPC03.04	Maintain and use operational systems to achieve smooth operation of facilities.	20	3.10	0	5	8	7	3.20	0	3	10	7
Totals:		463	2.90	59	84	169	151	3.13	8	72	230	151

Section VIII – Assessment Protocol Certification Protocol

Deliverable #7

Title: Protocol for Career Clusters Assessment

8/5/2002 4:00 PM

Definition of Career Clusters Assessment

Assessment, within the context of the Career Clusters Initiative, is defined as *a **measurement** of what a learner should know and be able to do*. The academic and technical knowledge and skills common to all occupations and pathways within a single cluster are initially addressed in the Career Clusters Initiative. Each cluster measures or assesses a learner's knowledge and skills related to the cluster.

Purpose of the Protocol for Career Clusters Assessments

The purpose of this document is to provide:

- Minimum criteria for selecting existing assessment instruments that align to the academic and technical knowledge and skills identified for each cluster.
- Minimum criteria for developing new assessment instruments that align to the academic and technical knowledge and skills identified for each cluster.
- Minimum criteria for validating and determining reliability of assessment instruments.

Functions of Career Clusters Assessment

Career Cluster Assessment serves to

- *measure* (assess) *student achievement*, both cognitive and performance, in areas of academic and technical knowledge and skills for each cluster
- *provide the basis* for a transportable, industry-endorsed certification.

Operational Guidelines for Career Clusters Assessment

This protocol includes minimum criteria/expectations career cluster designers need to apply in the selection/development of assessment modalities. Career clusters assessment:

CONTENT

- measures all 10 Foundation knowledge and skills.
- customizes context of questions and applications to individual clusters.
- reflects a high degree of specificity of measurable knowledge and skills.
- aligns to academic standards.
- connects to post high school standards and competencies.
- is consistent with Perkins data-quality criteria.

FORM

- combines a minimum of two modalities: cognitive and performance.
- includes an item bank that can accommodate multiple applications.
- reflects quality design and clear formats.

APPLICATIONS AND USES

- offers diagnostic feedback to the learner.
- provides added value to the user (employer, post high school); not required for employment.
- affords portability of results.
- provides cues for instruction.

ADMINISTRATION

- validates identity of test takers through a secure system.
- affords flexible administration, e.g. single assessment per foundation cluster topic or combination of topics.
- provides flexible timing for administration.
- affords no cost or low cost to students.
- includes an affordable, user-friendly process to cover administrative costs.
- reflects an administration process that is as consistent as possible with other career cluster assessments.
- includes an affordable, user-friendly maintenance process.

VALIDITY AND RELIABILITY

- uses consistent, reliable, and technically strong elements.
- is recognized by business and industry.
- is recognized by post high school education and training.

Deliverable #8

Title: Protocol for Career Clusters Certification

8/23/2002 2:28 PM

Definition of Career Clusters Certification

Certification, within the context of the States' Career Clusters Initiative, *documents* learner achievement of the academic and technical knowledge and skills common to all pathways and occupations within a cluster. It is based on valid and reliable assessments. A certificate is recognized by employers, secondary education, and post high school education as "value added to the admissions process to further education, immediate employment process, and/or to employment advancement".

Purposes of the Protocol for Careers Cluster Certification

The purposes of this document are to provide:

- Minimum criteria for selecting existing certification programs that align to the academic and technical knowledge and skills identified for each cluster.
- Minimum criteria for developing new certification programs that align to the academic and technical knowledge and skills identified for each cluster.
- Minimum criteria for determining the value of a certification program.

Functions of Career Clusters Certification

Career Cluster Certification serves to provide a consistent, transportable method of documenting learner achievement of a Career Cluster's validated academic and technical knowledge and skills. The system is based on valid and reliable assessments.

Operational Guidelines for Career Clusters Certification

This protocol includes minimum criteria/expectations career cluster designers need to apply in the selection/development of certification processes. Career clusters certification:

- Defines the purpose and scope of the certificate.
- Bases issue of the certificate on assessed learner proficiencies and competencies related to a Career Cluster's validated academic and technical knowledge and skills.
- Requires learner to meet the assessment benchmark identified.
- Informs the public concerning the knowledge and skills of the certificate holder.
- Indicates date of issue on the certificate.
- Issues certificate from the State (State Director of Career-Technical Education or appropriate designee) if the issuing organization is a secondary or post secondary education institution.
- Issues certificate from the CEO (or an appropriate designee) of an issuing professional organization/agency/institution/company.
- Requires issuing organization to maintain a database (state and/or national) of certificate holders based on the respective term of renewal.



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